

SEQUENCE LISTING

<110> Dartois, Veronique A.
Hoch, James A.
Valle, Fernando
Kumar, Manoj

<120> 2, 5-DKG PERMEASES

<130> P-SR 4877

<150> US 09/633,294

<151> 2000-08-04

<150> US 09/677,032

<151> 2000-09-29

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Met Asn Ser Ser Thr Asn Ala

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Tyr Ala Glu Arg Arg Ser Val Arg Lys Leu Ile Phe Ile Cys Leu Ile	
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Leu Trp Gly Ala Cys Ala Ser Leu Asp Arg Asp Gly Ala Gln Tyr Ser	
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Ser Ala Gly Trp Arg Ser Val Leu Phe Ser Ala Val Val Glu Ala Ala	
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gtc atg ccg gcg atg ctg att tac atc agt aac tgg ttt acc aaa tca	498
Val Met Pro Ala Met Leu Ile Tyr Ile Ser Asn Trp Phe Thr Lys Ser	
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Glu Arg Ser Arg Ala Asn Thr Phe Leu Ile Leu Gly Asn Pro Val Thr	
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Gln Gln Gly Ile Lys Ala Val Arg Asn Tyr Gly Glu Ala Phe Arg Ser	
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Arg Asn Val Ile Leu Leu Cys Met Gln Tyr Phe Ala Trp Ser Ile Gly	
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Val Tyr Gly Phe Val Leu Trp Leu Pro Ser Ile Ile Arg Ser Gly Gly	
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Val Thr Gln Ser Gln Ala Ile Pro Lys Leu Arg Trp Leu Arg Ile Val																	
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Pro Pro Ile Leu Ile Thr Cys Ile Ile Ser Tyr Met Asp Arg Val Asn																	
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Ile Ala Phe Ala Met Pro Gly Gly Met Asp Asp Glu Leu Gly Ile Thr																	
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Ala Ser Met Ala Gly Leu Ala Gly Gly Ile Phe Phe Ile Gly Tyr Leu																	
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Phe Leu Gln Val Pro Gly Gly Lys Leu Ala Val Tyr Gly Asn Gly Lys																	
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Lys Phe Ile Gly Trp Ser Leu Leu Ala Trp Ala Val Ile Ser Val Leu																	
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Ile Met Phe Val Pro Ile Ala Gly Ile Leu Thr Ala Pro Leu Ser Gly	
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Ala Leu Ser Leu Val Val Met Val Leu Trp Tyr Phe Thr Ile Ser Asn	
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Arg Pro Gln Glu Ala Lys Arg Ile Ser Gln Ala Glu Lys Asp Tyr Leu	
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Ile Lys Thr Leu His Asp Glu Gln Leu Leu Ile Lys Gly Lys Thr Val	
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Arg Asn Ala Ser Leu Arg Arg Val Leu Gly Asp Lys Ile Met Trp Lys	
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1052250

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Ala	Glu	Met	Ala	Gly	Gly	Ala	Arg	Gly	Val	Ile	Asn	Ala	Leu	Gly	Asn		
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Ala	Ser	Val	Leu	Ala	Leu	Met	Leu	Pro	Asn	Arg	Cys	Asp	Gln	Lys	Ala		
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Gly	Ala	Glu															
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Ala Asn Phe Ser Phe Ala Ser Ala Ala Gly Ile Thr Glu Asp Leu Gly
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Arg Phe Ile Leu Gly Val Val Glu Ala Ala Val Met Pro Ala Met Leu
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Thr Phe Leu Ile Leu Gly Asn Pro Val Thr Val Leu Trp Met Ser Val
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Val Arg Asn Tyr Gly Glu Ala Phe Arg Ser Arg Asn Val Val Leu Leu				
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Cys Met Gln Tyr Phe Ala Trp Ser Ile Gly Val Tyr Gly Phe Val Leu				
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 130 135 140
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 Val Pro Ala Val Ile Trp Ala Phe Cys Trp Trp Val Leu Val Lys Asp
 180 185 190
 Lys Pro Ser Gln Val Asn Trp Leu Ala Glu Ser Glu Lys Ala Ala Leu
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 Gln Glu Gln Leu Glu Arg Glu Gln Gln Gly Ile Lys Pro Val Arg Asn
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 Tyr Gly Glu Ala Phe Arg Ser Arg Asn Val Val Leu Leu Cys Met Gln
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 260 265 270
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TEB20-FOG200

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Met Gln Lys Ser Gln Pro Gly

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gca gta cgt ggc agt ggt aaa cgt ttt att gcc tgg tgc ctt gtt gcc 474
Ala Val Arg Gly Ser Gly Lys Arg Phe Ile Ala Trp Ser Leu Val Ala

75					80					85						
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Trp	Ala	Val	Val	Ser	Val	Ala	Thr	Gly	Phe	Val	Thr	His	Gln	Tyr	Gln	
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ctg	ttg	att	tta	cgt	ttt	gca	ctg	ggg	gtc	tct	gaa	ggg	ggg	atg	ttg	570
Leu	Leu	Ile	Leu	Arg	Phe	Ala	Leu	Gly	Val	Ser	Glu	Gly	Gly	Met	Leu	
105					110					115						
ccg	gta	gtt	ctg	aca	atg	gtc	agc	aac	tgg	ttt	cct	gaa	aaa	gag	ctg	618
Pro	Val	Val	Leu	Thr	Met	Val	Ser	Asn	Trp	Phe	Pro	Glu	Lys	Glu	Leu	
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Trp	Leu	Phe	Ile	Ile	Glu	Gly	Leu	Leu	Ser	Val	Val	Val	Leu	Ala	Val	
170					175					180						
tgg	tgg	ctg	atg	gtc	agt	gac	cgc	cct	gaa	gat	gcc	cgt	tgg	ctg	ccg	810
Trp	Trp	Leu	Met	Val	Ser	Asp	Arg	Pro	Glu	Asp	Ala	Arg	Trp	Leu	Pro	
185					190					195						
gca	gca	gaa	cgg	gaa	tat	ctg	ctg	cgc	gaa	atg	gcc	cgt	gac	aag	gcc	858
Ala	Ala	Glu	Arg	Glu	Tyr	Leu	Leu	Arg	Glu	Met	Ala	Arg	Asp	Lys	Ala	
200	205					210					215					
gag	cgg	agc	aaa	ctc	cct	ccg	atc	agt	cat	gct	ccc	ctg	caa	gag	gtt	906
Glu	Arg	Ser	Lys	Leu	Pro	Pro	Ile	Ser	His	Ala	Pro	Leu	Gln	Glu	Val	
220					225					230						
ttc	cat	aac	ccg	ggc	ctg	atg	aag	tta	gtg	att	ctg	aac	ttt	ttc	tat	954
Phe	His	Asn	Pro	Gly	Leu	Met	Lys	Leu	Val	Ile	Leu	Asn	Phe	Phe	Tyr	
235					240					245						
cag	aca	ggg	gat	tac	gga	tac	act	ctg	tgg	ctg	ccg	act	att	atc	aaa	1002
Gln	Thr	Gly	Asp	Tyr	Gly	Tyr	Thr	Leu	Trp	Leu	Pro	Thr	Ile	Ile	Lys	
250					255					260						
aac	ctg	acc	gga	gct	agt	att	ggg	aac	gtc	ggg	ttg	ctg	aca	gtg	cta	1050
Asn	Leu	Thr	Gly	Ala	Ser	Ile	Gly	Asn	Val	Gly	Leu	Leu	Thr	Val	Leu	
265					270					275						
cct	ttt	atc	gcg	acg	tta	tca	ggg	att	tat	gtc	gtc	tct	tac	ctg	agc	1098
Pro	Phe	Ile	Ala	Thr	Leu	Ser	Gly	Ile	Tyr	Val	Val	Ser	Tyr	Leu	Ser	
280	285					290					295					

Met	Gln	Lys	Ser	Gln	Pro	Gly	Thr	Arg	Trp	Phe	Arg	Ile	Ile	Val	Pro
1				5					10					15	
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			20					25					30		
Phe	Ala	Leu	Pro	Gly	Gly	Met	Glu	Gln	Asp	Leu	Leu	Met	Ser	Ser	Gln
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gttgcccctt cggcacacac aggatgttcc ccc atg aat aca agc aga aaa ctg 174
Met Asn Thr Ser Arg Lys Leu
1 5

ccg gtg aaa cgc tgg tgg tat tta atg ccg gtg att ttt att act tac 222
Pro Val Lys Arg Trp Trp Tyr Leu Met Pro Val Ile Phe Ile Thr Tyr
10 15 20

agc ctg gca tat ctg gat cgg gcc aac tac ggc ttt gct gct gcc tct 270
Ser Leu Ala Tyr Leu Asp Arg Ala Asn Tyr Gly Phe Ala Ala Ala Ser
25 30 35

ggg att gaa gca gat ctt gga att agc cgt ggc acc tcc tct ctg att 318
Gly Ile Glu Ala Asp Leu Gly Ile Ser Arg Gly Thr Ser Ser Leu Ile
40 45 50 55

gga gca ctg ttc ttt ctc ggc tac ttc att ttt cag gtg ccc ggg gca 366
Gly Ala Leu Phe Phe Leu Gly Tyr Phe Ile Phe Gln Val Pro Gly Ala
60 65 70

att tat gca gtg aaa cgc agt gtc cgt aaa ctg gtg ttt acc agc ctg 414
Ile Tyr Ala Val Lys Arg Ser Val Arg Lys Leu Val Phe Thr Ser Leu
75 80 85

ctg ttg tgg gga ttt tgt gcc gct gcg acc gga ctt atc agc aat att 462
Leu Leu Trp Gly Phe Cys Ala Ala Ala Thr Gly Leu Ile Ser Asn Ile
90 95 100

ccg gct ctg atg gtg atc cgc ttt gtt ctg ggt gtt gtt gaa gcc gca 510
Pro Ala Leu Met Val Ile Arg Phe Val Leu Gly Val Val Glu Ala Ala
105 110 115

gtg atg cca gcg atg ctg att tac atc agc aac tgg ttc acc cgt cag 558
Val Met Pro Ala Met Leu Ile Tyr Ile Ser Asn Trp Phe Thr Arg Gln
120 125 130 135

gaa cgt tca cgg gct aat acc ttt ctg gta tta ggt aac ccg gtc acg 606
Glu Arg Ser Arg Ala Asn Thr Phe Leu Val Leu Gly Asn Pro Val Thr
140 145 150

gtg tta tgg atg tct att gtt tcc gga tat ctg atc aat gct ttt ggc 654
Val Leu Trp Met Ser Ile Val Ser Gly Tyr Leu Ile Asn Ala Phe Gly
155 160 165

TC0330-10360

tgg	cgg	gaa	atg	ttt	att	ttc	gag	ggg	gtg	cct	gcc	tta	atc	tgg	gcc	702
Trp	Arg	Glu	Met	Phe	Ile	Phe	Glu	Gly	Val	Pro	Ala	Leu	Ile	Trp	Ala	
		170					175					180				
atc	ttc	tgg	tgg	ttt	att	gtc	cgg	gac	aaa	ccg	gag	cag	gtg	agc	tgg	750
Ile	Phe	Trp	Trp	Phe	Ile	Val	Arg	Asp	Lys	Pro	Glu	Gln	Val	Ser	Trp	
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ctg	aca	gaa	aca	gaa	aag	cag	caa	ctg	gcc	agt	gca	atg	gct	gaa	gag	798
Leu	Thr	Glu	Thr	Glu	Lys	Gln	Gln	Leu	Ala	Ser	Ala	Met	Ala	Glu	Glu	
200					205					210					215	
cag	cag	gca	ata	cca	ccg	atg	cgc	aat	gtg	ccg	cag	gcc	ctg	cgt	tcc	846
Gln	Gln	Ala	Ile	Pro	Pro	Met	Arg	Asn	Val	Pro	Gln	Ala	Leu	Arg	Ser	
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cgc	aat	gtg	gtg	gta	ctg	tgc	ctg	tta	cac	gct	ctg	tgg	agc	atc	gga	894
Arg	Asn	Val	Val	Val	Leu	Cys	Leu	Leu	His	Ala	Leu	Trp	Ser	Ile	Gly	
			235				240						245			
gtg	tat	ggg	ttt	atg	atg	tgg	atg	cca	tcg	ata	ctg	cgt	agc	gct	gca	942
Val	Tyr	Gly	Phe	Met	Met	Trp	Met	Pro	Ser	Ile	Leu	Arg	Ser	Ala	Ala	
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tca	atg	gac	att	gtc	cgg	gta	ggc	tgg	ctg	gcc	gca	gtt	ccg	tat	ctg	990
Ser	Met	Asp	Ile	Val	Arg	Val	Gly	Trp	Leu	Ala	Ala	Val	Pro	Tyr	Leu	
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gcc	gcg	att	att	act	atg	ctg	gtg	att	tca	tgg	ctg	tca	gat	aaa	acc	1038
Ala	Ala	Ile	Ile	Thr	Met	Leu	Val	Ile	Ser	Trp	Leu	Ser	Asp	Lys	Thr	
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ggg	ctg	cgt	cgg	ctt	ttt	atc	tgg	cca	tta	ttg	ctg	att	gcg	tca	gtt	1086
Gly	Leu	Arg	Arg	Leu	Phe	Ile	Trp	Pro	Leu	Leu	Leu	Ile	Ala	Ser	Val	
				300				305						310		
act	ttt	ttt	ggg	tcc	tgg	tta	ctt	ggg	agc	tac	tca	ttc	tgg	ttt	tcc	1134
Thr	Phe	Phe	Gly	Ser	Trp	Leu	Leu	Gly	Ser	Tyr	Ser	Phe	Trp	Phe	Ser	
			315					320					325			
tat	ggc	ttg	ctg	gta	ctg	gct	gct	gct	tgt	atg	tat	gcc	ccg	tat	gga	1182
Tyr	Gly	Leu	Leu	Val	Leu	Ala	Ala	Ala	Cys	Met	Tyr	Ala	Pro	Tyr	Gly	
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ccg	ttt	ttt	gcg	ttg	att	cct	gaa	ttg	ctg	cca	aaa	aat	gtg	gcg	ggg	1230
Pro	Phe	Phe	Ala	Leu	Ile	Pro	Glu	Leu	Leu	Pro	Lys	Asn	Val	Ala	Gly	
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Ile	Ser	Ile	Gly	Leu	Ile	Asn	Cys	Cys	Gly	Ala	Leu	Gly	Ala			

gga gcc tgg ctg	gtg ggc tat ctt aat ggt ctg acc ggt ggt ccg ggg	1326
Gly Ala Trp Leu	Val Gly Tyr Leu Asn Gly Leu Thr Gly Gly Pro Gly	
	380 385 390	
gct tct tac act ttt atg gcc att gca ttg ctg gtt tct gta ggg ttg		1374
Ala Ser Tyr Thr Phe Met Ala Ile Ala Leu Leu Val Ser Val Gly Leu		
	395 400 405	
gtg ttt ttc ctg aaa gtc cct tca ggg aat ttg gtc act cgt ccg ttg		1422
Val Phe Phe Leu Lys Val Pro Ser Gly Asn Leu Val Thr Arg Arg Leu		
	410 415 420	
ctg aaa ggt gat gca aag taaaaggaat agcgatgaaa cggaacagga		1470
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<213> Pantoea citrea		
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Tyr Gly Phe Ala Ala Ala Ser Gly Ile Glu Ala Asp Leu Gly Ile Ser		
35 40 45		
Arg Gly Thr Ser Ser Leu Ile Gly Ala Leu Phe Phe Leu Gly Tyr Phe		
50 55 60		
Ile Phe Gln Val Pro Gly Ala Ile Tyr Ala Val Lys Arg Ser Val Arg		
65 70 75 80		
Lys Leu Val Phe Thr Ser Leu Leu Leu Trp Gly Phe Cys Ala Ala Ala		
85 90 95		
Thr Gly Leu Ile Ser Asn Ile Pro Ala Leu Met Val Ile Arg Phe Val		
100 105 110		
Leu Gly Val Val Glu Ala Ala Val Met Pro Ala Met Leu Ile Tyr Ile		
115 120 125		
Ser Asn Trp Phe Thr Arg Gln Glu Arg Ser Arg Ala Asn Thr Phe Leu		
130 135 140		
Val Leu Gly Asn Pro Val Thr Val Leu Trp Met Ser Ile Val Ser Gly		
145 150 155 160		
Tyr Leu Ile Asn Ala Phe Gly Trp Arg Glu Met Phe Ile Phe Glu Gly		
165 170 175		
Val Pro Ala Leu Ile Trp Ala Ile Phe Trp Trp Phe Ile Val Arg Asp		
180 185 190		
Lys Pro Glu Gln Val Ser Trp Leu Thr Glu Thr Glu Lys Gln Gln Leu		
195 200 205		
Ala Ser Ala Met Ala Glu Glu Gln Gln Ala Ile Pro Pro Met Arg Asn		
210 215 220		
Val Pro Gln Ala Leu Arg Ser Arg Asn Val Val Val Leu Cys Leu Leu		

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225          230          235          240
His Ala Leu Trp Ser Ile Gly Val Tyr Gly Phe Met Met Trp Met Pro
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Ser Ile Leu Arg Ser Ala Ala Ser Met Asp Ile Val Arg Val Gly Trp
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Leu Ala Ala Val Pro Tyr Leu Ala Ala Ile Ile Thr Met Leu Val Ile
          275          280          285
Ser Trp Leu Ser Asp Lys Thr Gly Leu Arg Arg Leu Phe Ile Trp Pro
          290          295          300
Leu Leu Leu Ile Ala Ser Val Thr Phe Phe Gly Ser Trp Leu Leu Gly
305          310          315          320
Ser Tyr Ser Phe Trp Phe Ser Tyr Gly Leu Leu Val Leu Ala Ala Ala
          325          330          335
Cys Met Tyr Ala Pro Tyr Gly Pro Phe Phe Ala Leu Ile Pro Glu Leu
          340          345          350
Leu Pro Lys Asn Val Ala Gly Ile Ser Ile Gly Leu Ile Asn Cys Cys
          355          360          365
Gly Ala Leu Gly Ala Phe Ala Gly Ala Trp Leu Val Gly Tyr Leu Asn
          370          375          380
Gly Leu Thr Gly Gly Pro Gly Ala Ser Tyr Thr Phe Met Ala Ile Ala
385          390          395          400
Leu Leu Val Ser Val Gly Leu Val Phe Phe Leu Lys Val Pro Ser Gly
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<210> 11
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<220>
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<222> (70)...(1386)

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      Met Asn Ile Thr Ser Asn Ser Thr Thr Lys Asp Ile Pro Arg
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Gln Arg Trp Leu Arg Ile Ile Pro Pro Ile Leu Ile Thr Cys Ile Ile
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Ser Tyr Met Asp Arg Val Asn Ile Ala Phe Ala Met Pro Gly Gly Met
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Asp Ala Asp Leu Gly Ile Ser Ala Thr Met Ala Gly Leu Ala Gly Gly
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GenBank F052660

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gcc	gtt	cac	ggg	agc	ggg	aag	aaa	ttt	atc	ggc	tgg	tcg	ctg	gtc	gcc	351	
Ala	Val	His	Gly	Ser	Gly	Lys	Lys	Phe	Ile	Gly	Trp	Ser	Leu	Val	Ala		
80						85						90					
tgg	gcg	gtc	atc	tcc	gtg	ctg	acg	ggg	tta	att	acc	aat	cag	tac	cag	399	
Trp	Ala	Val	Ile	Ser	Val	Leu	Thr	Gly	Leu	Ile	Thr	Asn	Gln	Tyr	Gln		
95			100						105						110		
ctg	ctg	gcc	ctg	cgc	ttc	tta	ctg	ggc	gtg	gcg	gaa	ggc	ggg	atg	ctg	447	
Leu	Leu	Ala	Leu	Arg	Phe	Leu	Leu	Gly	Val	Ala	Glu	Gly	Gly	Met	Leu		
			115						120						125		
ccg	gtc	gtt	ctc	acg	atg	atc	agt	aac	tgg	ttc	ccc	gac	gct	gaa	cgc	495	
Pro	Val	Val	Leu	Thr	Met	Ile	Ser	Asn	Trp	Phe	Pro	Asp	Ala	Glu	Arg		
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ggg	cgc	gcc	aac	gcg	att	gtc	att	atg	ttt	gtg	ccg	att	gcc	ggg	att	543	
Gly	Arg	Ala	Asn	Ala	Ile	Val	Ile	Met	Phe	Val	Pro	Ile	Ala	Gly	Ile		
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atc	acc	gcc	cca	ctc	tca	ggc	tgg	att	atc	acg	gtt	ctc	gac	tgg	cgc	591	
Ile	Thr	Ala	Pro	Leu	Ser	Gly	Trp	Ile	Ile	Thr	Val	Leu	Asp	Trp	Arg		
160						165						170					
tgg	ctg	ttt	att	atc	gaa	ggg	ttg	ctc	tcg	ctg	gtt	gtt	ctg	gtt	ctg	639	
Trp	Leu	Phe	Ile	Ile	Glu	Gly	Leu	Leu	Ser	Leu	Val	Val	Leu	Val	Leu		
175			180						185						190		
tgg	gca	tac	acc	atc	tat	gac	cgt	ccg	cag	gaa	gcg	cgc	tgg	att	tcc	687	
Trp	Ala	Tyr	Thr	Ile	Tyr	Asp	Arg	Pro	Gln	Glu	Ala	Arg	Trp	Ile	Ser		
			195						200						205		
gaa	gca	gag	aag	cgc	tat	ctg	gtc	gag	acg	ctg	gcc	gcg	gag	caa	aaa	735	
Glu	Ala	Glu	Lys	Arg	Tyr	Leu	Val	Glu	Thr	Leu	Ala	Ala	Glu	Gln	Lys		
210						215						220					
gcc	att	gcc	ggc	acc	gag	gtg	aaa	aac	gcc	tct	ctg	agc	gcc	gtt	ctc	783	
Ala	Ile	Ala	Gly	Thr	Glu	Val	Lys	Asn	Ala	Ser	Leu	Ser	Ala	Val	Leu		
225						230						235					
tcc	gac	aaa	acc	atg	tgg	cag	ctt	atc	gcc	ctg	aac	ttc	ttc	tac	cag	831	
Ser	Asp	Lys	Thr	Met	Trp	Gln	Leu	Ile	Ala	Leu	Asn	Phe	Phe	Tyr	Gln		
240						245						250					
acc	ggc	att	tac	ggc	tac	acc	ctg	tgg	cta	ccc	acc	att	ctg	aaa	gaa	879	
Thr	Gly	Ile	Tyr	Gly	Tyr	Thr	Leu	Trp	Leu	Pro	Thr	Ile	Leu	Lys	Glu		
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Asp	Leu	Gly	Ile	Ser	Ala	Thr	Met	Ala	Gly	Leu	Ala	Gly	Gly	Ile	Phe
	50					55				60					
Phe	Ile	Gly	Tyr	Leu	Phe	Leu	Gln	Val	Pro	Gly	Gly	Lys	Ile	Ala	Val
65					70					75					80
His	Gly	Ser	Gly	Lys	Lys	Phe	Ile	Gly	Trp	Ser	Leu	Val	Ala	Trp	Ala
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Val	Ile	Ser	Val	Leu	Thr	Gly	Leu	Ile	Thr	Asn	Gln	Tyr	Gln	Leu	Leu
			100					105					110		
Ala	Leu	Arg	Phe	Leu	Leu	Gly	Val	Ala	Glu	Gly	Gly	Met	Leu	Pro	Val
		115				120						125			
Val	Leu	Thr	Met	Ile	Ser	Asn	Trp	Phe	Pro	Asp	Ala	Glu	Arg	Gly	Arg
	130					135					140				
Ala	Asn	Ala	Ile	Val	Ile	Met	Phe	Val	Pro	Ile	Ala	Gly	Ile	Ile	Thr
145					150					155					160
Ala	Pro	Leu	Ser	Gly	Trp	Ile	Ile	Thr	Val	Leu	Asp	Trp	Arg	Trp	Leu
				165					170					175	
Phe	Ile	Ile	Glu	Gly	Leu	Leu	Ser	Leu	Val	Val	Leu	Val	Leu	Trp	Ala
			180					185					190		
Tyr	Thr	Ile	Tyr	Asp	Arg	Pro	Gln	Glu	Ala	Arg	Trp	Ile	Ser	Glu	Ala
		195				200						205			
Glu	Lys	Arg	Tyr	Leu	Val	Glu	Thr	Leu	Ala	Ala	Glu	Gln	Lys	Ala	Ile
	210					215					220				
Ala	Gly	Thr	Glu	Val	Lys	Asn	Ala	Ser	Leu	Ser	Ala	Val	Leu	Ser	Asp
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Lys	Thr	Met	Trp	Gln	Leu	Ile	Ala	Leu	Asn	Phe	Phe	Tyr	Gln	Thr	Gly
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Ile	Tyr	Gly	Tyr	Thr	Leu	Trp	Leu	Pro	Thr	Ile	Leu	Lys	Glu	Leu	Thr
			260					265					270		
His	Ser	Ser	Met	Gly	Gln	Val	Gly	Met	Leu	Ala	Ile	Leu	Pro	Tyr	Val
		275					280					285			
Gly	Ala	Ile	Ala	Gly	Met	Phe	Leu	Phe	Ser	Ser	Leu	Ser	Asp	Arg	Thr
	290					295					300				
Gly	Lys	Arg	Lys	Leu	Phe	Val	Cys	Leu	Pro	Leu	Ile	Gly	Phe	Ala	Leu
305					310					315					320
Cys	Met	Phe	Leu	Ser	Val	Ala	Leu	Lys	Asn	Gln	Ile	Trp	Leu	Ser	Tyr
				325					330					335	
Ala	Ala	Leu	Val	Gly	Cys	Gly	Phe	Phe	Leu	Gln	Ser	Ala	Ala	Gly	Val
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Phe	Trp	Thr	Ile												

430

ctt tcg gcg gcc cgc gag cgc ggc atc cgc gtc acc aac acg ccc gac 585
Leu Ser Ala Ala Arg Glu Arg Gly Ile Arg Val Thr Asn Thr Pro Asp

85	90	95	
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Val Leu Thr Lys Asp	Val Ala Asp Leu Gly Ile Ala Met Met Leu Ala		
100	105 110		
cag gcg cgc ggc gtc atc ggc gga gag gcc tgg gtg aag agc ggc gat	681		
Gln Ala Arg Gly Val Ile Gly Gly Glu Ala Trp Val Lys Ser Gly Asp			
115	120 125 130		
tgg gca agc aag ggt ctc tat ccg ctg aag cgc cgc gta cat ggc atg	729		
Trp Ala Ser Lys Gly Leu Tyr Pro Leu Lys Arg Arg Val His Gly Met			
135	140 145		
cgc gcc ggg gtg ctc ggc ctc ggc cgc atc ggc tac gag gtg gcc aag	777		
Arg Ala Gly Val Leu Gly Leu Gly Arg Ile Gly Tyr Glu Val Ala Lys			
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cgc ctt gcc ggc ttc gac atg gac atc gcc tac agc gac acc ggc ccg	825		
Arg Leu Ala Gly Phe Asp Met Asp Ile Ala Tyr Ser Asp Thr Gly Pro			
165	170 175		
aag gat ttc gcc agg gac tgg acc ttc gtc gcc gat ccg gcg gag ctg	873		
Lys Asp Phe Ala Arg Asp Trp Thr Phe Val Ala Asp Pro Ala Glu Leu			
180	185 190		
gcc gcc cgc tcc gac ttc ctc ttc gtc acg ctc gcc gcc tcc gcc gag	921		
Ala Ala Arg Ser Asp Phe Leu Phe Val Thr Leu Ala Ala Ser Ala Glu			
195	200 205 210		
acg cgc cac atc gtc ggc cgc aag gtc atc gag gcg ctc ggc cct gag	969		
Thr Arg His Ile Val Gly Arg Lys Val Ile Glu Ala Leu Gly Pro Glu			
215	220 225		
ggc atg ctg atc aac atc tcg cgc gct tcc aac atc gat gaa agc gcc	1017		
Gly Met Leu Ile Asn Ile Ser Arg Ala Ser Asn Ile Asp Glu Ser Ala			
230	235 240		
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aac gtc ctc ttg cag ccg cac atg gcc tcc ggc acg atc gag acc cgc	1161		
Asn Val Leu Leu Gln Pro His Met Ala Ser Gly Thr Ile Glu Thr Arg			
275	280 285 290		
aag gcc atg ggc cag ctc gtc ttc gac aac ctg tcg gcc cat ttc gac	1209		
Lys Ala Met Gly Gln Leu Val Phe Asp Asn Leu Ser Ala His Phe Asp			
295	300 305		

ggc Gly	cgg Arg	ccg Pro	ctg Leu	ccg Pro	acc Thr	ccg Pro	gtt Val	ctg Leu	taaggagagaga	ggccc	atg Met	aag Lys	gcg Ala	1260		
310						315										
atc Ile	gtc Val	atc Ile	cat His	cag Gln	gcc Ala	aag Lys	gac Asp	ctg Leu	cgc Arg	gtc Val	gag Glu	gac Asp	agc Ser	gcc Ala	gtc Val	1308
320						325			330							
gag Glu	gcg Ala	ccc Pro	ggc Gly	ccc Pro	ggc Gly	gag Glu	gtg Val	gag Glu	atc Ile	cgc Arg	ctt Leu	gcc Ala	gcc Ala	ggc Gly	ggc Gly	1356
335			340						345			350				
atc Ile	tgc Cys	ggc Gly	tcg Ser	gac Asp	ctg Leu	cac His	tac Tyr	tac Tyr	aac Asn	cac His	ggc Gly	ggc Gly	ttc Phe	ggc Gly	acg Thr	1404
			355						360			365				
gtg Val	cgc Arg	ctc Leu	aag Lys	gag Glu	ccg Pro	atg Met	atc Ile	ctc Leu	ggc Gly	cat His	gag Glu	gtt Val	tcc Ser	ggc Gly	cac His	1452
			370			375						380				
gtc Val	gcg Ala	gcg Ala	ctc Leu	ggc Gly	gaa Glu	ggc Gly	gtc Val	tcc Ser	ggc Gly	ctt Leu	gcc Ala	atc Ile	ggc Gly	gac Asp	ctc Leu	1500
385						390						395				
gtc Val	gcc Ala	gtc Val	tcg Ser	ccc Pro	tcg Ser	cgg Arg	ccc Pro	tgc Cys	ggg Gly	gcg Ala	tgc Cys	gac Asp	tat Tyr	tgc Cys	ctc Leu	1548
400						405			410							
aag Lys	ggc Gly	ttg Leu	gcg Ala	aac Asn	cat His	tgc Cys	ttc Phe	aac Asn	atg Met	cgc Arg	ttc Phe	tac Tyr	ggc Gly	tcg Ser	gcc Ala	1596
415			420						425			430				
atg Met	ccc Pro	ttc Phe	ccg Pro	cac His	atc Ile	cag Gln	ggc Gly	gcg Ala	ttc Phe	cgc Arg	gag Glu	ccg Arg	ctg Leu	gtc Val	gcc Ala	1644
			435			440						445				
aag Lys	gcc Ala	agc Ser	cag Gln	tgc Cys	gtg Val	aag Lys	gct Ala	gag Glu	ggc Gly	ctt Leu	tcg Ser	gca Ala	ggc Gly	gaa Glu	gcc Ala	1692
			450			455			460							
gcg Ala	atg Met	gcc Ala	gag Glu	ccg Pro	ctc Leu	tcc Ser	gtc Val	acg Thr	ctt Leu	cac His	gcc Ala	acg Thr	cgc Arg	cgg Arg	gcc Ala	1740
465						470			475							
ggc Gly	gaa Glu	atg Met	ctg Leu	ggc Gly	aag Lys	cgc Arg	gtg Val	ctc Leu	gtc Val	acc Thr	ggc Gly	tgc Cys	ggg Gly	ccg Pro	atc Ile	1788
480						485			490							
ggc Gly	acc Thr	ctg Leu	tcg Ser	atc Ile	ctc Leu	gcc Ala	gcc Ala	cgg Arg	cgc Arg	gcc Ala	ggc Gly	gcg Ala	gcg Ala	gag Glu	atc Ile	1836
495			500						505			510				

gtc	gcc	gct	gac	ctt	tcc	gag	cgt	gca	ctc	ggc	ttt	gcc	cgc	gcc	gtc		1884
Val	Ala	Ala	Asp		Leu	Ser	Glu	Arg	Ala	Leu	Gly	Phe	Ala	Arg	Ala	Val	
				515						520					525		
ggc	gcg	gac	cgc	acg	gtc	aac	ctg	tcg	gaa	gac	cgc	gac	ggc	ctc	gtt		1932
Gly	Ala	Asp	Arg	Thr	Val	Asn	Leu	Ser	Glu	Asp	Arg	Asp	Gly	Leu	Val		
			530					535					540				
ccg	ttc	agc	gag	aac	aag	gga	tat	ttc	gat	gtc	ctc	tac	gaa	tgc	tcg		1980
Pro	Phe	Ser	Glu	Asn	Lys	Gly	Tyr	Phe	Asp	Val	Leu	Tyr	Glu	Cys	Ser		
		545					550					555					
ggc	gcc	cag	ccg	gcg	ctg	gtt	gcc	ggc	atc	cag	gcc	ttg	cgc	ccg	cgc		2028
Gly	Ala	Gln	Pro	Ala	Leu	Val	Ala	Gly	Ile	Gln	Ala	Leu	Arg	Pro	Arg		
	560					565					570						
ggc	gtc	atc	gtc	cag	ctc	ggc	ctc	ggc	ggc	gag	atg	agc	ctt	ccc	atg		2076
Gly	Val	Ile	Val	Gln	Leu	Gly	Leu	Gly	Gly	Glu	Met	Ser	Leu	Pro	Met		
575					580					585					590		
atg	gcg	atc	acc	gcc	aag	gaa	ctg	gac	ctg	cgc	ggc	tcc	ttc	cgc	ttc		2124
Met	Ala	Ile	Thr	Ala	Lys	Glu	Leu	Asp	Leu	Arg	Gly	Ser	Phe	Arg	Phe		
			595					600						605			
cat	gag	gaa	ttc	gcc	gtc	gcc	gtg	aag	ctg	atg	cag	ggc	ggc	ctc	atc		2172
His	Glu	Glu	Phe	Ala	Val	Ala	Val	Lys	Leu	Met	Gln	Gly	Gly	Leu	Ile		
			610					615					620				
gac	gtg	aag	ccg	ctg	atc	acc	cat	act	ttg	ccg	ctt	gcc	gat	gcg	ctt		2220
Asp	Val	Lys	Pro	Leu	Ile	Thr	His	Thr	Leu	Pro	Leu	Ala	Asp	Ala	Leu		
		625					630					635					
cag	gcc	ttc	gag	atc	gcc	tcg	gac	aag	ggg	caa	tcg	atg	aag	act	cag		2268
Gln	Ala	Phe	Glu	Ile	Ala	Ser	Asp	Lys	Gly	Gln	Ser	Met	Lys	Thr	Gln		
	640					645					650						
atc	gca	ttc	agt	taagggaagag cc atg agc atc cag ctt ttc gac ctc acg				Ile Ala Phe Ser Met Ser Ile Gln Leu Phe Asp Leu Thr								2319	
Ile	Ala	Phe	Ser					660					665				
655																	
ggc	aag	cgc	gcc	ctc	gtc	acc	ggc	tcc	tcg	cag	ggt	atc	ggc	tat	gcg		2367
Gly	Lys	Arg	Ala	Leu	Val	Thr	Gly	Ser	Ser	Gln	Gly	Ile	Gly	Tyr	Ala		
		670					675					680					
ctc	gcc	aag	ggc	ctt	gcc	gcc	gcc	ggc	gcg	gac	atc	gtc	ctc	aac	ggc		2415
Leu	Ala	Lys	Gly	Leu	Ala	Ala	Ala	Gly	Ala	Asp	Ile	Val	Leu	Asn	Gly		
	685					690					695						
cgc	gac	gcg	gcc	aag	ctg	gcg	gcc	gcg	gcg	cag	gaa	ctc	ggc	gca	aag		2463
Arg	Asp	Ala															

His Thr Leu Ala Phe Asp Ala Thr Asp His Ala Ala Val Arg Ala Ala	
720 725 730	
atc gac gcc ttc gag gcg gag gtc ggc ccc atc gac atc ctc gtc aac	2559
Ile Asp Ala Phe Glu Ala Glu Val Gly Pro Ile Asp Ile Leu Val Asn	
735 740 745	
aat gcc ggc atg cag cac cgc acg ccg ctg gag gat ttc ccc gcc gat	2607
Asn Ala Gly Met Gln His Arg Thr Pro Leu Glu Asp Phe Pro Ala Asp	
750 755 760	
gcc ttc gag cgc atc ctg aag acc aac atc tcg acg gtc ttc aat gtc	2655
Ala Phe Glu Arg Ile Leu Lys Thr Asn Ile Ser Thr Val Phe Asn Val	
765 770 775	
ggc cag gcc gtc gcg cgc cac atg atc gcg cgc ggc gcg ggc aag atc	2703
Gly Gln Ala Val Ala Arg His Met Ile Ala Arg Gly Ala Gly Lys Ile	
780 785 790 795	
atc aac atc gcc agc gtg cag acc gcg ctc gcc cgc ccc ggc atc gcg	2751
Ile Asn Ile Ala Ser Val Gln Thr Ala Leu Ala Arg Pro Gly Ile Ala	
800 805 810	
ccc tat acc gcc acc aag ggc gcc gtc ggc aac ctc acc aag ggc atg	2799
Pro Tyr Thr Ala Thr Lys Gly Ala Val Gly Asn Leu Thr Lys Gly Met	
815 820 825	
gcg acc gac tgg gcg aaa tac ggc ctg caa tgc aac gcc atc gcg ccg	2847
Ala Thr Asp Trp Ala Lys Tyr Gly Leu Gln Cys Asn Ala Ile Ala Pro	
830 835 840	
ggc tat ttc gac acg ccg ctc aat gcc gcg ctg gtc gcc gat ccg gcc	2895
Gly Tyr Phe Asp Thr Pro Leu Asn Ala Ala Leu Val Ala Asp Pro Ala	
845 850 855	
ttt tcc gcc tgg ctg gaa aag cgc acg ccg gcc ggc cgc tgg ggc aag	2943
Phe Ser Ala Trp Leu Glu Lys Arg Thr Pro Ala Gly Arg Trp Gly Lys	
860 865 870 875	
gtg gag gag ctg atc ggc gcc tgc atc ttt ctt tcc tcc gac gct tcc	2991
Val Glu Glu Leu Ile Gly Ala Cys Ile Phe Leu Ser Ser Asp Ala Ser	
880 885 890	
tcc ttc gtg aac gga cac acg ctc tat gtc gac ggc ggc atc acg gcc	3039
Ser Phe Val Asn Gly His Thr Leu Tyr Val Asp Gly Gly Ile Thr Ala	
895 900 905	
tcg ctc tgaggacaac aggcgcacgc tctgatggg cgtcgccggc tgcggcaagt	3095
Ser Leu	
ccgcgcgtcgg cgcggcgctc gccgcgcggc tcggtgcgat ccccggggtac cgagctcg	3153

<210> 14
 <211> 315
 <212> PRT
 <213> Unknown

<220>
 <223> environmental source

<400> 14

Met	Ser	Lys	Ile	Asp	Val	Leu	Gln	Val	Gly	Pro	Tyr	Pro	Ala	Trp	Asp
1				5					10					15	
Glu	Glu	Arg	Leu	Asn	Ala	Thr	Phe	Thr	Met	His	Arg	Tyr	Phe	Glu	Ala
			20					25					30		
Ala	Asp	Lys	Ala	Ala	Phe	Leu	Ala	Glu	His	Gly	Gly	Thr	Ile	Arg	Gly
		35					40					45			
Ile	Ala	Thr	Arg	Gly	Glu	Leu	Gly	Ala	Asn	Arg	Ala	Met	Ile	Glu	Ala
		50				55					60				
Leu	Pro	Lys	Leu	Glu	Val	Ile	Ser	Val	Tyr	Gly	Val	Gly	Phe	Asp	Ala
65					70					75					80
Val	Asp	Leu	Ser	Ala	Ala	Arg	Glu	Arg	Gly	Ile	Arg	Val	Thr	Asn	Thr
				85					90					95	
Pro	Asp	Val	Leu	Thr	Lys	Asp	Val	Ala	Asp	Leu	Gly	Ile	Ala	Met	Met
			100					105					110		
Leu	Ala	Gln	Ala	Arg	Gly	Val	Ile	Gly	Gly	Glu	Ala	Trp	Val	Lys	Ser
		115					120					125			
Gly	Asp	Trp	Ala	Ser	Lys	Gly	Leu	Tyr	Pro	Leu	Lys	Arg	Arg	Val	His
		130				135					140				
Gly	Met	Arg	Ala	Gly	Val	Leu	Gly	Leu	Gly	Arg	Ile	Gly	Tyr	Glu	Val
145					150					155					160
Ala	Lys	Arg	Leu	Ala	Gly	Phe	Asp	Met	Asp	Ile	Ala	Tyr	Ser	Asp	Thr
				165					170					175	
Gly	Pro	Lys	Asp	Phe	Ala	Arg	Asp	Trp	Thr	Phe	Val	Ala	Asp	Pro	Ala
			180					185					190		
Glu	Leu	Ala	Ala	Arg	Ser	Asp	Phe	Leu	Phe	Val	Thr	Leu	Ala	Ala	Ser
		195					200					205			
Ala	Glu	Thr	Arg	His	Ile	Val	Gly	Arg	Lys	Val	Ile	Glu	Ala	Leu	Gly
		210				215					220				
Pro	Glu	Gly	Met	Leu	Ile	Asn	Ile	Ser	Arg	Ala	Ser	Asn	Ile	Asp	Glu
225					230					235					240
Ser	Ala	Leu	Leu	Asp	Ala	Leu	Glu	Thr	Lys	Ala	Leu	Gly	Ser	Ala	Ala
			245						250					255	
Leu	Asp	Val	Phe	Glu	Gly	Glu	Pro	Asn	Leu	Asn	Pro	Arg	Phe	Leu	Ala
			260					265					270		
Leu	Asp	Asn	Val	Leu	Leu	Gln	Pro	His	Met	Ala	Ser	Gly	Thr	Ile	Glu
		275					280					285			
Thr	Arg	Lys	Ala	Met	Gly	Gln	Leu	Val	Phe	Asp	Asn	Leu	Ser	Ala	His
		290				295					300				
Phe	Asp	Gly	Arg	Pro	Leu	Pro	Thr	Pro	Val	Leu					
305					310					315					

<210> 15
 <211> 343

<212> PRT

<213> Unknown

<220>

<223> environmental source

<400> 15

Met	Lys	Ala	Ile	Val	Ile	His	Gln	Ala	Lys	Asp	Leu	Arg	Val	Glu	Asp	1	5	10	15
Ser	Ala	Val	Glu	Ala	Pro	Gly	Pro	Gly	Glu	Val	Glu	Ile	Arg	Leu	Ala	20	25	30	
Ala	Gly	Gly	Ile	Cys	Gly	Ser	Asp	Leu	His	Tyr	Tyr	Asn	His	Gly	Gly	35	40	45	
Phe	Gly	Thr	Val	Arg	Leu	Lys	Glu	Pro	Met	Ile	Leu	Gly	His	Glu	Val	50	55	60	
Ser	Gly	His	Val	Ala	Ala	Leu	Gly	Glu	Gly	Val	Ser	Gly	Leu	Ala	Ile	65	70	75	80
Gly	Asp	Leu	Val	Ala	Val	Ser	Pro	Ser	Arg	Pro	Cys	Gly	Ala	Cys	Asp	85	90	95	
Tyr	Cys	Leu	Lys	Gly	Leu	Ala	Asn	His	Cys	Phe	Asn	Met	Arg	Phe	Tyr	100	105	110	
Gly	Ser	Ala	Met	Pro	Phe	Pro	His	Ile	Gln	Gly	Ala	Phe	Arg	Glu	Arg	115	120	125	
Leu	Val	Ala	Lys	Ala	Ser	Gln	Cys	Val	Lys	Ala	Glu	Gly	Leu	Ser	Ala	130	135	140	
Gly	Glu	Ala	Ala	Met	Ala	Glu	Pro	Leu	Ser	Val	Thr	Leu	His	Ala	Thr	145	150	155	160
Arg	Arg	Ala	Gly	Glu	Met	Leu	Gly	Lys	Arg	Val	Leu	Val	Thr	Gly	Cys	165	170	175	
Gly	Pro	Ile	Gly	Thr	Leu	Ser	Ile	Leu	Ala	Ala	Arg	Arg	Ala	Gly	Ala	180	185	190	
Ala	Glu	Ile	Val	Ala	Ala	Asp	Leu	Ser	Glu	Arg	Ala	Leu	Gly	Phe	Ala	195	200	205	
Arg	Ala	Val	Gly	Ala	Asp	Arg	Thr	Val	Asn	Leu	Ser	Glu	Asp	Arg	Asp	210	215	220	
Gly	Leu	Val	Pro	Phe	Ser	Glu	Asn	Lys	Gly	Tyr	Phe	Asp	Val	Leu	Tyr	225	230	235	240
Glu	Cys	Ser	Gly	Ala	Gln	Pro	Ala	Leu	Val	Ala	Gly	Ile	Gln	Ala	Leu	245	250	255	
Arg	Pro	Arg	Gly	Val	Ile	Val	Gln	Leu	Gly	Leu	Gly	Gly	Glu	Met	Ser	260	265	270	
Leu	Pro	Met	Met	Ala	Ile	Thr	Ala	Lys	Glu	Leu	Asp	Leu	Arg	Gly	Ser	275	280	285	
Phe	Arg	Phe	His	Glu	Glu	Phe	Ala	Val	Ala	Val	Lys	Leu	Met	Gln	Gly	290	295	300	
Gly	Leu	Ile	Asp	Val	Lys	Pro	Leu	Ile	Thr	His	Thr	Leu	Pro	Leu	Ala	305	310	315	320
Asp	Ala	Leu	Gln	Ala	Phe	Glu	Ile	Ala	Ser	Asp	Lys	Gly	Gln	Ser	Met	325	330	335	
Lys	Thr	Gln	Ile	Ala	Phe	Ser										340			

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<210> 16
 <211> 251
 <212> PRT
 <213> Unknown

<220>
 <223> environmental source

<400> 16
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 1 5 10 15
 Gly Ser Ser Gln Gly Ile Gly Tyr Ala Leu Ala Lys Gly Leu Ala Ala
 20 25 30
 Ala Gly Ala Asp Ile Val Leu Asn Gly Arg Asp Ala Ala Lys Leu Ala
 35 40 45
 Ala Ala Ala Gln Glu Leu Gly Ala Lys His Thr Leu Ala Phe Asp Ala
 50 55 60
 Thr Asp His Ala Ala Val Arg Ala Ala Ile Asp Ala Phe Glu Ala Glu
 65 70 75 80
 Val Gly Pro Ile Asp Ile Leu Val Asn Asn Ala Gly Met Gln His Arg
 85 90 95
 Thr Pro Leu Glu Asp Phe Pro Ala Asp Ala Phe Glu Arg Ile Leu Lys
 100 105 110
 Thr Asn Ile Ser Thr Val Phe Asn Val Gly Gln Ala Val Ala Arg His
 115 120 125
 Met Ile Ala Arg Gly Ala Gly Lys Ile Ile Asn Ile Ala Ser Val Gln
 130 135 140
 Thr Ala Leu Ala Arg Pro Gly Ile Ala Pro Tyr Thr Ala Thr Lys Gly
 145 150 155 160
 Ala Val Gly Asn Leu Thr Lys Gly Met Ala Thr Asp Trp Ala Lys Tyr
 165 170 175
 Gly Leu Gln Cys Asn Ala Ile Ala Pro Gly Tyr Phe Asp Thr Pro Leu
 180 185 190
 Asn Ala Ala Leu Val Ala Asp Pro Ala Phe Ser Ala Trp Leu Glu Lys
 195 200 205
 Arg Thr Pro Ala Gly Arg Trp Gly Lys Val Glu Glu Leu Ile Gly Ala
 210 215 220
 Cys Ile Phe Leu Ser Ser Asp Ala Ser Ser Phe Val Asn Gly His Thr
 225 230 235 240
 Leu Tyr Val Asp Gly Gly Ile Thr Ala Ser Leu
 245 250

<210> 17
 <211> 32
 <212> DNA
 <213> Artificial Sequence

<220>
 <223> synthetic construct

<400> 17
 acccaagctt caccaaaaga gtgaagagga ag

<210> 18
 <211> 34
 <212> DNA
 <213> Artificial Sequence

<220>
 <223> synthetic construct

<400> 18
 cgtatctaga aaaatattct ggtgatgaag gtga 34

<210> 19
 <211> 34
 <212> DNA
 <213> Artificial Sequence

<220>
 <223> synthetic construct

<400> 19
 agactctaga tccacataaa cgcactgcgt aaac 34

<210> 20
 <211> 33
 <212> DNA
 <213> Artificial Sequence

<220>
 <223> synthetic construct

<400> 20
 gaggggatcc tggcttcgtg aacgatatac tgg 33

<210> 21
 <211> 31
 <212> DNA
 <213> Artificial Sequence

<220>
 <223> synthetic construct

<400> 21
 aataggatcc ttcattacca gaatatTTTT a 31

<210> 22
 <211> 28
 <212> DNA
 <213> Artificial Sequence

<220>
 <223> synthetic construct

